NATURAL RESOURCES CONSERVATION SERVICE

CONSERVATION PRACTICE STANDARD

LAND RECLAMATION
FIRE CONTROL

(No.)

CODE 451

DEFINITION

Controlling or extinguishing fires in coal refuse.

SCOPE

This standard applies to the coal fires in spoil and refuse from surface or underground coal mining activities, generally associated with abandoned mine lands.

PURPOSE

To control or extinguish coal spoil or refuse fires to eliminate harmful fumes and gases, improve public safety, conserve coal resources, prevent ignition of additional coal or refuse, protect surface lands and vegetation, remove the threat of forest fires, improve water quality, and restore areas to a beneficial use.

CONDITIONS WHERE PRACTICE APPLIES

Locations where coal refuse is burning and degrading the environment. Land reconstructing will normally be associated with this practice.

PLANNING CONSIDERATIONS

1. Area of burning material.

2. Geologic sections of the strata where coal is burning.

3. Hazardous fumes and gases being released.

4. Ignition potential for other combustible materials.

5. Materials available for extinguishing the fire and stabilizing the area.

DESIGN CRITERIA

NRCS fire control will normally be limited to small fires that are a part of a larger land reconstruction project. Major fires should be controlled by other agencies. Many mine reclamation jobs have the potential to burn and the principles in this standard should be used for fire prevention on all abandoned mine reclamation work. Coal refuse must never be left on the surface.

There are four primary methods for controlling mine fires, depending on the condition. They are (1) loading out, (2) fire barriers (trench and plug), (3) flushing (grouting), and (4) surface sealing.

Loading out. This involves digging out the burning and heated material, and cooling it with water or by spreading it on the ground. The excavation should start between the fire and the unburned coal material. The burning materials must be cooled by water to allay dust and reduce the probability of explosions and to prevent damage to machinery. The cooled material can then be disposed of in a safe manner either on the site or at a disposal area. The area containing all the combustible material must then be protected from ignition by surface sealing with soil material or a method that provides equivalent results.

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Fire barriers. A trench barrier is made by excavating a trench, usually from an outcrop on one side of the fire to an outcrop on the other side, between the burning material and the unburned material. The trench is backfilled with incombustible materials such as earth, fly ash, or granulated slag. The sides of the trench excavation must be stable. The minimum thickness of the incombustible backfill barrier is 4.6 m (15 ft)

A plug barrier is used where excessive overburden prevents use of a trench barrier. The plug is installed similar to a trench barrier except that the trenches are started at an outcrop and stopped when the overburden exceeds 18 m (60 ft). Two plugs will normally be required, one on each side of the fire. The surface over the fire between the two plugs must be sealed where the overburden exceeds 18 m(60 ft).

Flushing. This method is designed to fill the voids around an underground fire area with finely divided incombustible solids to prevent airflow to the burning materiel. This method is applicable where excessive overburden or improvements preclude the use of other methods.

To construct the barrier, 15-cm (6-in) holes are bored in the mine void on 3-m (10-ft) centers. Holes on adjacent lines are to be staggered. Sand, water-cooled slag, crushed limestone, and crushed and screened earth or shale can be slurried into the mine through the holes. Another alternative is to use air flushing injection of dry fly ash material. Barriers constructed by this method may consist of one row of 15-cm (6-in) boreholes on 7.6-m (25-ft) centers. In each case the installation must be monitored to ensure that enough fine incombustible material is installed to make the barrier effective. Angle drilling around improvements and other obstructions may be necessary.

Surface sealing. Surface sealing is used on fires that have extended for a great distance, or it is used in conjunction with other control measures. Sealing is obtained by covering the affected area with not less than 1.2 m (4 ft) of incombustible fine-grained earth material or other suitable material. Materials that will not crack upon drying out should be used. The seal should extend from 3 m (10 ft) below the burning material to 18 m (60 ft) above. All openings and drains must be sealed to cut off the flow of oxygen. Drainage pipes with traps to prevent air and gas passage may be used if continuous water drainage is necessary. Erosion must be controlled to prevent braking the seal. Intensive water disposal systems are required to ensure an effective seal.

MONITORING

Treated mine fire areas are to be monitored to ensure that the fire is out. Fires extinguished by loading out may be monitored by surface inspection. Other fire areas shall have monitoring holes installed into the burning zone. The monitoring holes shall not exceed a 61-m (200-ft) spacing in any direction. The monitoring holes shall be sealed and the temperature monitors. A weighted thermocouple is lowered into the hole and the temperature read on the surface with a potentiometer. Thermometers may be used for shallow holes. Temperatures should be read at least every 60 days. Monitoring may be stopped when the maximum temperature in all wells reaches 48.8 °C (120 °F) or less and the trend is down.

MAINTENANCE

A maintenance plan will be developed, including mandatory temperature monitoring. Regular periodic inspections must be carried out until the fire is extinguished and the area is stabilized. Needed maintenance must be carried out promptly to ensure a successful operation.

PROTECTION

All disturbed areas shall be reshaped and regraded to blend with surrounding features. Visual resources must be considered in the planning, design, and installation. Exposed toxic material and rock shall be covered with soil material and established with vegetation or protected by other means. Access roads must be maintained and foot and vehicular traffic controlled to protect the work.

PLANS AND SPECIFICATIONS

Plans and specifications for controlling mine and refuse fires shall be in keeping with this standard and shall describe the requirements for applying the practice to achieve its intended purpose.

PLANNING CONSIDERATIONS FOR WATER QUANTITY AND QUALITY

QUANTITY

1. Effects on the water budget, especially on volumes and rates of runoff, infiltration, evaporation, transpiration, deep percolation and ground water recharge.

2. Effects of vegetation on soil moisture.

QUALITY

1. Effects on erosion and the movement of sediment and soluble and sediment-attached substances carried by runoff.

2. Effects of nutrients and pesticides and their effect on surface and ground water quality.

3. Effect on the visual quality of downstream and local water resources.

4. Short-term and construction-related effects of this practice on the quality of the surface and ground water.

5. Long-term effects of the management and maintenance of this practice on surface and ground water quality.

6. The potential for uncovering toxic materials and spreading them in areas that might cause undesirable effects.

7. The effects on wetlands and water-related wildlife habitats.